Journal of Nematology 23(3):342–343. 1991.

Rotation and Cropping Systems for Nematode Control: The North Carolina Experience—Introduction[1]

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The papers presented in this colloquium on rotation-cropping systems studies in North Carolina resulted in part from an invitation for the authors to bring together and present many years of concentrated research on the subject. This brief introduction describes the purpose of combining five contributions which cover 3½ decades of investigations on a wide range of crop–nematode combinations. The existence of a broad North Carolina data base on this old and re-emerging research area was the prime impetus for the colloquium and the following publications. Early rotation studies in the 1950s and 1960s by the late C. J. Nusbaum (*Meloidogyne* spp. on various crops), and J. P. Ross and J. N. Sasser (*Heterodera glycines*) established the potential of this tactic in nematode management on tobacco and soybean in the state. The Nusbaum data were analyzed for this presentation by C. E. Main and Sarah Nusser. The recent work on cropping systems by D. P. Schmitt and J. P. Noe et al. is based on conventional rotation concepts, current approaches to and principles of cropping systems, and integrated crop protection.

Although often ignored by many growers, primarily because of limited land availability, crop rotation is one of the oldest and most effective methods of managing phytoparasitic nematodes. A clarification between crop rotation and cropping system should be made. Agronomic crop rotation is the fixed annual or sub-annual sequence and spatial arrangement of crops, or the succession of crops and fallow on a specific land area (2,4). This practice may include natural or planted crops. In contrast, cropping systems encompass the sequence of growing different crops and the necessary technologies for their production (3,4). Varied quantitative analyses of the pest–crop-management relations, as performed by Noe et al., are essential for maximizing the utility of cropping systems. Most studies on rotations and cropping systems to date have focused on crop successions for given fields. Such research could be expanded to include intracropping practices as used in numerous developing countries. The economy of effort required in all of these studies can be maximized by their integration with other crop protection disciplines.

Additional tools are becoming available that should facilitate further development of cropping systems. The use of computers and improved software will aid managers and consultants with the planning and record keeping that are essential for maintaining economical and effective cropping systems. In addition to improved crop-loss models, emerging molecular techniques for nematode identification (1) offer additional means of monitoring shifts in their polyspecific communities. As these techniques are refined, the option for analyzing soils for the species, biotypes and races, and levels of target nematodes would greatly augment the potential applications of cropping systems research.

Most of the data presented in the following papers are being published in a detailed format for the first time. This wide range of information should serve as important background for research on low-input sustainable agriculture and integrated crop protection. In addition, this long-term experimentation on rotation and cropping systems by a single department provides a

Received for publication 13 August 1990.

[1] Colloquium presented at the 27th Annual Meeting of the Society of Nematologists, 12–16 June 1988, Raleigh, NC. Two additional contributions by C. J. Nusbaum, S. Nusser, and C. E. Main will be published in a subsequent issue.

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focal point from which these concepts and tactics can be applied to improve nematode management. The effectiveness of crop rotation is demonstrated through the work of Nusbaum, Sasser, Schmitt, and associates. The combination of rotation in various cropping systems, encompassing resistant cultivars, modified tillage, planting dates, and management of associated pests, has immense potential. The findings of Schmitt and Noe et al. serve as examples of the latter. Thus, these articles present views and insights on the evolving methodologies and concepts in managing plant-parasitic nematodes through manipulating diverse crops over some 3 decades. It is our hope that integrated management approaches will provide tools to enable growers to overcome some of the most critical hurdles facing them today—as described in the five contributions.

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